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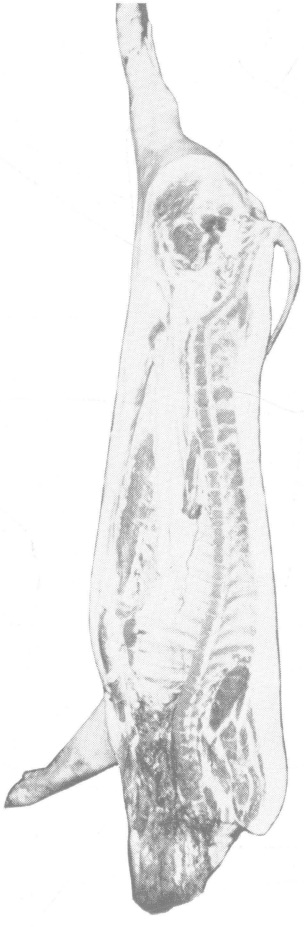
Formula Pricing of HOGS under present day conditions



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FORMULA PRICING OF HOGS UNDER PRESENT DAY CONDITIONS

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PURPOSE AND OBJECTIVES

The primary objective was to develop a formula that may be used in pricing live-graded hogs, weighing from 195 to 220 pounds from which carcasses are obtained weighing approximately from 135 to 155 pounds. This work included the development of information that would be useful to all segments of the marketing and pork slaughtering industry in the value determinations of hogs by live-grade. Consideration was given to the importance of the primal cuts and fat cuts according to weight, quality and value differences. The varying relationship of the wholesale price structure was studied considering the conditions, both physical and economic, which exert an influence on a changing pattern which influences the value to the retailer and processor.

INTRODUCTION

Little research work designed to price live-graded hogs according to their value has been done, but several studies have contributed a background and suggested the need for such investigation. Ohio Agricultural Experiment Station Bulletin 728, "Market Hogs Can Be Accurately Graded" is an example of such research.

Some Problems of Pricing Live Hogs Equitably

Hogs generally have been marketed on the basis of an average price paid for each of the several established market weight groups, with little or no consideration given to any merits associated with value that might exist for hogs within each weight group. In many markets, variation about this average price was small from one sale to the next on the given market day, i.e., the range was narrow. This is the system of buying based upon averages; averages as regards both price and the absence of value discrimination.

Over a period of time the enterprising packer has been able to sort out hogs of high value or low value and sell the products of his plant accordingly. But in the wholesale markets the farmer received an average price for the entire lot of hogs that fell within any specific market weight group as they were marketed from day to day. Such a system failed to reflect, at progressive points along the marketing channel, the various quality distinctions desired and failed to encourage the offering of hogs of optimum desirability to the market.

With the arrival in recent years of more hogs of meat-type characteristics, marketing problems have become more acute.

Dissent on Part of Producers

Hogs that are now considered Grade 1, or meat type, or above average, whatever the term preferred, often bring more on the market today than will an average, or Grade 2 hog. However, the Grade 2 hog (average) and the Grade 3, (below average) hog will generally command the same quoted market price with no discrimination made against the lower grade.[1] Some improvement has thus been made over previous procedures, but not to the extent that might be desired. This does, however, imply acceptance of the idea that there should be a differential which favors the hog of higher value, i.e., Grade 1, which is being marketed by many farmers in the eastern Corn Belt and elsewhere today.

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[1]Actual grade specifications are shown in Table 1

To date there has been no published attempt made to statistically determine how great such an intergrade differential should be, not only for the purpose of paying a positive differential (premium) for the Grade 1 hog, but also for subjecting the Grade 3 hog to a negative differential (discount). An arbitrary differential of 50 or 75 cents has been paid for the Grade 1 hog in some cases, but such a differential has not been related accurately to pork product values. Even so, it has frequently been said that such a differential is too large.

There is justification for such feeling among buyers, for the trade is hesitant to discriminate against the Grade 3 hog. But determining a maximum differential arbitrarily and reluctance to discount the low grade hog had contradictory influences. The buyer who purchases only Grade 2 or Grade 3 hogs cannot afford to pay a lower price when any nearby competitor does not differentiate between grades. Nor can the buyer who purchases all three grades discriminate against the Grade 3 hog when his competitor buys only low value hogs and pays the quoted price. In such a situation a very realistic limitation is placed upon the dollar amount of the differential that can be paid for the Grade 1, meat-type hog over the Grade 2 hog.

If the true value were paid for Grade 3 as well, overall expenditures would tend to counterbalance one another, and the farmer would receive the true value for all three grades.

The purpose of this study is to investigate the possibilities for developing a formula which could be used under changing economic conditions, notably price variations. The formula should equitably determine differentials for the Grade 1 and Grade 3 hogs above and below the quoted market price for the Grade 2 hog.

The attempt is made herein to develop the formula that shall make known by a simple, arithmetic procedure the differentials which represent the carcass values of No. 1, No. 2 and No. 3 hogs.

Grade Standards Used in the Study

The grade standards established and presented in Ohio Agricultural Experiment Station Bulletin 728, which classified live market hogs into Grades 1, 2 and 3 on the basis of percent of total chilled carcass weight in the four lean cuts, were based upon nine physical factors of the carcass. A multiple correlation of these factors explained 94.5 percent of the total variation in the percent of total carcass represented by the four lean cuts.

Of these nine factors, three were outstanding in their importance. Those three factors: average backfat thickness, carcass length, and hind leg length, explained 72.0 percent of the total variation. Average

backfat thickness alone explained 66.9 percent of the variation. For practical purposes, it is on the basis of these three factors that live hogs may be graded by marketing agencies.

Ohio Bulletin 728 presented the grade standards established therein for the several market weight groups between 170 and 250 pounds live weight. These standards, which show an overlap between grades, are summarized in Table 1. This study was concerned with the grade standards for the live weight group of 195 to 220 pounds and was based upon the standards established for that specific weight category.

TABLE 1.—Standards Established in Ohio Agricultural Experiment Station Bulletin 728 for Grading Live Hogs in Three Weight Groups

Weights and Grades		Percent of four lean cuts	Backfat Inches	Body length Inches	Hind leg Inches
Carcass weight	115-135 lbs.				
Equivalent live weight	170-195 lbs.	**Range**	**Range**	**Range**	**Range**
	Grade 1	52.5 and up	1.4 and under	28.0 and up	18.7 and up
	2	48.5–51.4	1.5–1.7	27.5–27.9	18.4–18.6
	3	Under 47.5	1.8 and up	Under 27.5	Under 18.4
Carcass weight	135-155 lbs.				
Equivalent live weight	195-220 lbs.				
	Grade 1	51.5 and up	1.6 and under	29.0 and up	19.6 and up
	2	47.5–50.9	1.7–1.9	28.5–28.9	19.1–19.5
	3	Under 47.0	2.0 and up	Under 28.5	Under 19.1
Carcass weight	155-175 lbs.				
Equivalent live weight	220-250 lbs.				
	Grade 1	51.0 and up	1.7 and under	30.0 and up	20.1 and up
	2	47.0–50.4	1.8–2.0	29.2–29.9	19.4–20.0
	3	Under 46.5	2.1 and up	Under 29.2	Under 19.4

Source: Ohio Agricultural Experiment Station Bulletin 728.

For simplicity, this study eliminated the overlap in percent of four lean cuts between Grades 1 and 2 and Grades 2 and 3 by allowing percent of four lean cuts in the Grade 1 carcass to decline as low as 51.0 percent, and in the Grade 2 carcass to decline to 47.0 percent. Such procedure, which had the same effect as assuming that all hogs on the borderline between grades would be up graded, allowed for the development of a differential along conservative lines, i.e., the differential

developed by any formula would represent an underestimate rather than an overestimate of the differential that would probably exist under the same price conditions in actual practice.

METHOD OF STUDY

The Carcass Sample

This study involves the analysis of data on 563 hog carcasses, 70 of which had been used for analysis in the Ohio 728 study, and 493 of which were selected from studies then being conducted by the Ohio Swine Evaluation Station. Most live grading is presently done within the market weight group of 190-220 pounds; therefore, this study was concerned with that same weight classification. All carcasses in this study weighed between 135-155 pounds chilled, that being the weight which approximates a live weight of 195-220 pounds.

Raw data consisted of weights and measurements on: backfat thickness, body length and hind leg length. The carcasses were cut into wholesale portions, with care taken to maintain the identity of each cut with the live-graded carcass from which it had been taken. The weights of all hams, loins, picnics, butts, (shoulders in all Swine Evaluation Station data) and the miscellaneous items of jowls, spare ribs, neckbones, tails, feet, lean trim and fat were recorded.

Organized in the Autumn of 1954, the Ohio Swine Evaluation Station operates at Columbus, Ohio, in conjunction with the Animal Science Department and the Department of Agricultural Economics and Rural Sociology of the Ohio State University Agricultural Extension Service. The purpose of the Swine Station is "to select and recognize meat type breeding stock from Ohio herds that will improve efficiency of production and the market value of the great Ohio commercial hog crop." In carrying out this objective the Swine Evaluation Station conducts research with hundreds of pairs of promising hogs sent in by breeders throughout the state, and raises selected pigs to slaughter weight under carefully controlled conditions. The groups of hogs analyzed are designated by the season of their birth and are thus referred to as Fall, 1954 hogs; Spring, 1955 hogs; Fall, 1956 hogs, etc.

Thus, in summary, the total sample for this study represented data on carcasses as follows:

The Price Sample

The prices used in establishing values in the study are those quoted on the National Provisioner Daily Market Service "Yellow Sheet." This source has wide coverage in the meat trade, appears to have satis-

TABLE 2.—Total Sample of Hog Carcasses by Grade

(Carcass Weight 135-155 Pounds Comparable to a Live Weight of 195-220 Pounds)

Sample source	Grade 1	Grade 2	Grade 3	Total
Ohio 728 Study	22	29	19	70
Fall 1954 Station	86	65	9	160
Spring 1955 Station	47	105	25	177
Fall 1955 Station	72	70	14	156
Total	227	269	67	563

Source: Original data from Ohio 728 Study, Ohio Agricultural Experiment Station, and original data from Ohio Swine Evaluation Station.

factory acceptability and respected accuracy. All available price quotations were not used; an average weekly price for the second week of each month was selected as the price sample for the study.

Such a price is not intended to be representative of the price for the entire month. It is representative of only that week for which the prices constituting the average were quoted. The "second week" of each month is defined in accordance with the method used by the United States Department of Agriculture in price quotations through the Market News Service. That is, during the week when the month changes, the whole week is taken as a week of that month which is represented by at least three days of the five day market week. For example, if the first of February, 1956 falls on Wednesday, then the first week of February is from Monday, January 30, 1956 to Friday, February 3, 1956. Hence the second week of February begins on Monday, February 6, 1956. The choice of the second week of each month, rather than the first, third, or fourth, was arbitrary.

Prices were gathered for the following cuts and weight classifications.[2] (1) Skinned Hams weighing 10-12; 12-14; 14-16 and 16-18 pounds; (2) Loins in the Under 12 and 12-16 pound weight groups; (3) Picnics in the 4-6; 6-8; and 8-10 pound weight groups; (4) Butts weighing 4-8 and 8-12 pounds; (5) Skinned Shoulders of the weight groups 16 pounds down and 16 pounds up; and (6) Bellies of the weight groups 8-10; 10-12; 12-14; 14-16; and 16-18 pounds. The miscellaneous cuts for which prices were gathered in the same manner

[2]Although additional prices were quoted for other weight classifications, hog carcasses that weigh between 135 and 155 pounds will not produce cuts in any weight categories other than the ones that are summarized here.

were first averaged by grades for the entire sample, and prices were then applied to the average weights to obtain values by grades. Prices for miscellaneous cuts, however, were not accumulated until a later phase in the study.

Frozen meat prices were not used. Only those prices quoted on fresh meat or quoted FFA[3] were used.

The Plan of Work

The plan of analysis on this project was to apply appropriate prices by weight classification to the weighed cuts comprising the sample, thus establishing values for all individual cuts making up the five primal cuts, i.e., hams, loins, picnics, butts[4] and bellies. The manner in which this was carried out is the subject of a later section. When the basic value data were compiled, the next step was to add the values of the individual cuts and obtain a total value of four lean cuts and five primal cuts for each carcass. This value was then converted to value per one hundred pounds of chilled carcass. The carcasses were classified according to the live grade standards outlined in Table 1 and a differential on the basis of four lean cuts and five primal cuts was extracted between grades. The consistency of such differentials were then tested under varying price conditions. The final segment of the analysis was determining how such differences could be computed, based upon the known value of only a portion of the carcass, determining what percent of total carcass value need be known to gain acceptable accuracy, developing necessary tables of constants, and testing alternative formula approaches for relative practicality and accuracy.

Limitations of the Data

At times during the course of the study there was some expressed doubt, in regard to the sample, that perhaps the data from the Swine Evaluation Station were not representative of the entire universe of market hogs. The research being conducted by that organization was designed to improve the breeding standards of Ohio herds. It was suggested that hogs tested at the Station must be of superior quality.

That superior quality may be characteristic of Swine Evaluation Station hogs is not denied. But the effect of live grading of market hogs must not be overlooked. Standardization into three grades gives the desired homogeniety to the group placed within each grade. Each hog is a representative of the grade in which it has been classified.

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[3]Fresh Freezer Accumulation.

[4]Sometimes packers sell New York Shoulders rather than picnics and butts.

In the main, any superiority found in the Swine Evaluation Station hogs will be indicated, as Table 2 shows, in a larger number of Grade 1 hogs and possibly Grade 2 hogs relative to the total number of hogs in the sample. This means that the total distribution of swine evaluation station hogs is probably more skewed to the right than is the total distribution of all market hogs of comparable weight to be found in the universe.

However, it may be expected that such superiority will cast some influence within each grade resulting in a distribution within the grade that is more skewed to the right in the sample than would be expected of the universe. This may be taken as a limitation of the data.

The approach to a reliable dressing percentage figure for the sample posed a research problem. Although the difficulties involved were bypassed, it might be appropriate to outline the nature of the limitations encountered in that respect. The Ohio Swine Evaluation Station employed a different carcass cutting procedure than did the Armour Packing Company, Columbus, which previously had cut out the 70 carcasses comprising the initial segment of the sample.

Personnel associated with this study were inclined to accept the method employed by Armour as being more representative of the procedure common to the meat packing industry at large. This method left a small jowl attached to the carcass, the leaf fat and kidneys were removed and the carcass was cut into the wholesale cuts, with the shoulder divided into picnic and butt. In some cases it was necessary to sum the weights of the wholesale and miscellaneous cuts to arrive at a total carcass weight and derive a dressing percentage. Any difference in cutting procedure has an influence on the total weight of the carcass and consequently the dressing percentage.

Conversely, the swine evaluation station left a large jowl attached to the carcass, hung the carcass (and weighed it) with the leaf fat and kidneys included, and did not break the shoulder down into picnic and butt. The sample thus showed a higher dressing percentage for Swine Evaluation Station hogs than it did for the 728 Study hogs. Specifically, the dressing percentages for the former hogs ranged from 71.87 to 73.54 percent while similar data for the sample drawn for the 728 Study ranged from 70.3 to 71.5 percent.

The problem lay in determining a homogeneous dressing percentage by grade for each of the three grades in the entire sample. Further, if such a figure could be computed it might represent the present sample quite adequately but, perhaps, with constant improvement in swine breeds over the years, such a static figure might not be representative a few years hence. Therefore, another alternative was considered.

The alternative was the use of dressing percentage figures quoted periodically by the United States Department of Agriculture in the Weekly Livestock Statistical Report. The advantage of this alternative was that it was dynamic and thus would continue to be representative as time passed. But the source had several disadvantages, the greatest or most severe being that the quotation was based upon total receipts. This involved two undesirable features. First, no grade differentiation was made which meant that the same dressing percentage would have to be used for each of the three grades of hogs. Second, this study was concerned specifically with hogs weighing between 195 and 220 pounds while the quotation represented an average of total receipts of all weights. Therefore, as the quotation varied from month to month, there was no assurance that this was an indication of a seasonal influence on dressing percentage; it could be no more than a reflection of receipts of the various market classifications of hogs during the course of a year. The influence of the marketing of sows, boars, and stags during the summer months would be particularly significant.

Thus, in summary, the problem was to choose between a dynamic dressing percentage quotation which was not representative of the specific sample and in which no grade differentiation was made, and a representative dressing percentage by grades which was static and needed adjustment in order to arrive at homogeneous figures for the entire sample. Because the possibility of reflecting a seasonal element still remained, the former alternative was first approached. Formula attempts based in part upon the quoted figures, however, did not yield an acceptable degree of accuracy and attention was turned once again to the dressing percentages indicated in the sample data.

Since the cutting procedure employed by Armour was believed to be more representative of the usual practice in industry than was swine station procedure, adjustment was made to favor the 728 Study data. The adjustment involved reducing the weight of all swine evaluation station carcasses by the weight of leaf fat and kidneys. With the weight of the carcasses reduced, computation of a new dressing percentage resulted in a figure which was much more comparable to that of the 728 Study data.

Because the adjustment resulted in an estimate of dressing percentage rather than an actual, known dressing percentage, it was felt that this constituted an unnecessary limitation upon the data and the search for alternatives continued throughout the duration of the study. In concluding phases of the analysis, a final alternative was attempted and

accepted. The final approach involved bypassing dressing percentage figures completely by working on the basis of given percentages of live weight rather than carcass weight.

COMPUTING VALUES

General Procedure

Values of wholesale cuts were determined by applying the price quoted for the appropriate weight group to a given cut of the corresponding weight classification. For example, the exact weight of a given ham that fell within the limits of the 10-12 pound weight classification was multiplied by the price quotation for that weight group, and that price represented an average for the second week of the month for which the price was applied. Thus, for the given ham, a price was applied once each month for a four year period beginning with January, 1953, and ending in December, 1956, resulting in forty-eight value figures for that cut. The same procedure was used for all hams, loins, picnics, butts, bellies and shoulders.

An example of the manner in which values were computed is presented in Table 3.

TABLE 3.—HAM VALUES: Sample of Value Data Based upon a Portion of 728 Study Sample, Ham Values, 1953 National Provisioner Price Quotation

(Value in Dollars)

Carcass number	Ham weight (Pounds)	Price weight Group	January	February	March	April	May	June
P27	21.8	10–12	10.91	11.11	11.36	11.35	11.79	12.13
C33	26.2	12–14	13.11	13.29	13.50	13.49	14.17	14.63
72	23.8	10–12	11.91	12.13	12.40	12.39	12.88	13.24
B46	23.3	10–12	11.66	11.87	12.14	12.13	12.61	12.97
D12	22.4	10–12	11.21	11.41	11.67	11.66	12.12	12.47
C97	27.1	12–14	13.56	13.75	13.96	13.95	14.66	15.13
E34	23.2	10–12	11.61	11.82	12.09	12.08	12.55	12.91
P1	26.4	12–14	13.21	13.39	13.60	13.59	14.28	14.74
B64	23.8	10–12	11.91	12.13	12.40	12.39	12.88	13.24
83	14.2 13.9	14–16 12–14	14.04	14.11	14.33	14.46	15.20	15.67
C12	26.2	12–14	13.11	13.29	13.50	13.49	14.17	14.63

Source: Original data.

When all value figures had been derived, the values by weeks for hams, loins, picnics and butts of each carcass were totaled resulting in a value for the four lean cuts of each carcass for the second week of each month for the 48 month period. Upon completion of that phase, the value for the belly of each carcass was added to the above total resulting in a value for the five primal cuts of each carcass over the same period.

Arraying the Value Data

The carcasses were graded on the basis of percent of chilled carcass comprised of four lean cuts in accordance with the specifications outlined in Table 1. The 70 carcasses from the 728 Study sample and the 160 carcasses from the Fall, 1954, Swine Evaluation Station sample were then arranged in separate and descending arrays on the basis of percent of four lean cuts with the arrays broken at the points of grade differentiation, i.e., at the points of minimum standard for Grade 1 and minimum standard for Grade 2. Thus, an array of the values of the four lean cuts, by months, for the 48 month period was developed.

A similar array, again based upon percent of four lean cuts, was arranged for comparable values of the five primal cuts over the same period.

With the data arrayed it was desirable, for comparative purposes, to reduce all value figures to a common base. This was accomplished by dividing the dollar value of four lean cuts or five primal cuts by the chilled weight of each carcass. The resulting figures represented values for the four lean cuts and five primal cuts per one hundred pounds of chilled carcass. A sample of these values, showing the presentation of data as it was used for this analysis is displayed in Table 4.

The Consistency of Value Decline

It was expected that there would be a decline in the value of four lean cuts as percent of four lean cuts declined. By averaging the values of all sets of four lean cuts and five primal cuts at each 1.0 percent change in percent of four lean cuts and then extracting the differential between the average values a satisfying degree of consistency in value decline became evident. This was particularly true with the four lean cuts and, although consistency existed in the value decline of five primal cuts, it was not as spectacular. The reason is obvious. The values for the four lean cuts were based upon an array of the percent of **four lean cuts themselves** while the value of **five primal cuts** was not based upon percent of **five primal cuts themselves,** but upon the former array based upon percent of **four lean cuts.** However, the fact that the value of four lean cuts was based upon an array of percent of four lean cuts doesn't nullify the importance of such consistency in value decline.

TABLE 4.—Partial Array of Value of Four Lean Cuts and Value of Four Lean Cuts per One Hundred Pounds of Chilled Carcass, Arrayed in Descending Order of Percent of Four Lean Cuts to Chilled Carcass Weight, Selected Months, 1953

Carcass number	Percent of four lean cuts	Chilled carcass weight	January		February		March		April	
			Value	Value cwt.	Value	Value cwt.	Value	Value cwt.	Value	Value cwt.
E60	55.5	153.6	34.54	22.49	36.63	23.85	36.46	23.74	37.47	24.39
N34	55.4	149.9	33.23	22.17	35.43	23.64	35.49	23.68	36.55	24.38
Average			——	22.33	——	23.74	——	23.71	——	24.39
D17	54.4	142.4	31.75	22.30	33.61	23.60	33.41	23.46	34.38	24.14
D31	54.3	141.5	31.79	22.47	33.66	23.79	33.45	23.64	34.45	24.35
A21	54.1	146.9	32.15	21.89	34.10	23.21	33.98	23.13	34.95	23.79
Average			——	22.21	——	23.53	——	23.41	——	24.09
D65	53.8	147.2	31.88	21.66	33.90	23.03	33.86	23.00	34.80	23.64
M35	53.6	149.0	31.82	21.36	34.18	22.94	34.10	22.89	34.84	23.39
P34	53.3	152 6	32.89	21.55	34.88	22.86	34.74	22.77	35.63	23.35
Average			——	21.52	——	22.94	——	22.88	——	23.46
83	52.7	137.8	29.68	21.54	31.43	22.81	31.27	22.69	32.05	23.26
S16	52.7	153.0	32.96	21.54	34.87	22.79	34.72	22.69	35.65	23.30
P 1	52.2	137.2	29.00	21.14	30.86	22.49	30.69	22.37	31.33	22.84
A15	52.2	149.4	31.72	21.23	33.55	22.46	33.35	22.32	34.33	22.98
B34	52.1	143.5	30.08	20.96	32.39	22.49	32.21	22.45	32.84	22.89
R35	52.1	152.2	32.68	21.47	34.53	22.57	34.34	22.56	35.32	23.21
K36	52.0	139.6	29.66	21.25	31.56	22.61	31.39	22.49	32.08	22.98
P 2	52.0	148.2	31.63	21.34	33.46	22.58	33.26	22.44	34.25	23.11
N 4	52.0	152.6	32.19	21.09	34.13	22.37	34.01	22.29	34.99	22.93
Average			——	21.29	——	22.59	——	22.48	——	23.06
P11	51.8	146.9	31.10	21.17	32.85	22.36	32.68	22.25	33.63	22.89
H60	51.8	149.2	31.64	21.21	33.41	22.39	33.24	22.28	34.22	22.94
C62	51.6	145.1	30.67	21.14	32.60	22.47	32.40	22.33	33.19	22.87
C33	51.3	136.2	28.59	20.99	30.50	22.39	30.31	22.25	30.91	22.69
N10	51.0	146.6	30.12	20.55	32.31	22 04	32.15	21.93	32.85	22.41
Average			——	21.01	——	22.33	——	22.21	——	22.76

TABLE 4.—Partial Array of Value of Four Lean Cuts and Value of Four Lean Cuts per One Hundred Pounds of Chilled Carcass, Arrayed in Descending Order of Percent of Four Lean Cuts to Chilled Carcass Weight, Selected Months, 1953—Continued

Carcass number	Percent of four lean cuts	Chilled carcass weight	January		February		March		April	
			Value	Value cwt.	Value	Value cwt.	Value	Value cwt.	Value	Value cwt.
E64	50.8	153.6	31.81	20.71	33.82	22.02	33.59	21.87	34.49	22.45
C97	50.7	136.9	29.00	21.18	30.85	22.53	30.64	22.38	31.28	22.85
R 7	50.7	146.4	30.54	20.86	32.48	22.19	32.26	22.04	33.09	22.60
N33	50.6	154.2	31.95	20.72	33.74	21.88	33.56	21.76	34.53	22.39
R20	50.4	148.4	30.53	20.57	32.36	21.81	32.18	21.68	32.99	22.23
N32	50.4	149.1	30.61	20.53	32.51	21.80	32.31	21.67	33.15	22.23
R 4	50.2	143.2	29.14	20.35	31.04	21.68	30.87	21.56	31.54	22.03
A13	50.2	145.9	29.73	20.38	31.79	21.79	31.67	21.71	32.30	22.14
E13	50.1	138.4	28.20	20.38	30.06	21.72	29.89	21.60	30.52	22.05
N23	50.0	140.5	28.29	20.14	30.17	21.47	29.98	21.34	30.64	21.81
Average			——	20.58	——	21.89	——	21.76	——	22.28
K10	49.9	141.1	29.05	20.59	30.94	21.93	30.72	21.77	31.36	22.23
P44	49.7	145.2	29.45	20.28	31.15	21.45	31.00	21.35	31.79	21.89
C23	49.6	143.5	29.11	20.29	31.09	21.67	30.89	21.53	31.52	21.97
R11	49.6	148.9	30.28	20.34	32.35	21.73	32.19	21.62	32.88	22.08
K25	49.6	150.4	30.31	20.15	32.34	21.50	32.13	21.36	32.84	21.84
B63	49.3	143.9	29.02	20.17	30.92	21.49	30.81	21.41	31.38	21.81
S27	49.1	144.4	29.02	20.10	30.96	21.44	30.78	21.32	31.41	21.75
P33	49.1	146.2	29.19	19.97	31.08	21.26	30.95	21.17	31.43	21.50
A11	49.1	147.8	29.53	19.98	31.50	21.31	31.31	21.18	31.94	21.61
Average			——	20.20	——	21.53	——	21.41	——	21.85

Source: Original data on selected 135-155 pound carcasses from the 728 study and selected 1953 National Provisioner prices.

The reader will recognize that, aside from the four lean cuts, there are many variables influencing the hog carcass that remain unaccounted for and that their movements may not be expected to counterbalance one another in a way that leaves the four lean cuts the only factor to be considered. Because two hogs may possess the same percent of four lean cuts in the carcass does not mean that the two carcasses, or the two sets of four lean cuts, or the two dressing percentages, or any other pair of factors are identical.

The consistency of the value decline with each 1.0 percent change in percent of four lean cuts is portrayed in Chart A. The reader will note in review of Chart A that there were two minor exceptions to the consistency of this value decline, both occurring in July. **This is an unusual circumstance, developing during temporarily abnormal supply and demand conditions in which a carcass may have a value slightly higher than another carcass which has a higher percent of four lean cuts. The development is usually the result of a combination of causes pertaining to price and weight relationships.** For example, lighter hams usually command the higher price. If this characteristic should become extreme, the carcass having the lighter ham and thus the lower percent of four lean cuts, may temporarily possess an unusually high value.

THE DIFFERENTIAL

General

Tables 5 and 6 present the weighted average value of four lean cuts per one hundred pounds of chilled carcass, by grades, for the four year period studied. Tables 7 and 8 show the same data for the five primal cuts over the same period.

It will be noted that, as price declines, the differential in value between Grade 1 and Grade 3 likewise diminishes. The time period included in this study covers a wide range in hog prices between January, 1953, and December, 1956,[5] and offers an excellent opportunity to study fluctuations in the differential.

An Elementary Means of Differential Pricing

At this point perhaps we have a first and most elementary formula alternative. The columns in Tables 5 through 8 show the percent of Grade 2 value which the differential represented, could be used as a rough estimate or a first step toward pricing hogs on a merit basis, i.e., a basis which fairly represents the actual values and recognizes the value differences in graded market hogs. If we assume that there will be no difference between grades in the value of spareribs, jowls, neckbones, tails, feet, lean trim, fat, (and belly in the case of four lean cuts), then we might use such a percentage as a rough estimate of the value of the three grades of live hogs simply by adding or subtracting the stated percentage from quoted market price which may be taken as representative of Grade 2 value. As far as it goes, this is not an unreasonable assumption. However, we cannot stop here because both the assumption and the method have serious flaws.

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[5]During the period studied the price of top hogs at Chicago ranged from a high of approximately $28.50 during April, 1954 to a low of about $11.75 per cwt. during December, 1955.

TABLE 5.—FOUR LEAN CUTS: Value of Four Lean Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956

(70 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
					Percent		Percent	
1953								
January	$21.48	$20.14	$18.58	$1.34	6.65	$1.56	7.75	$2.90
February	22.81	21.45	19.80	1.36	6.34	1.65	7.69	3.01
March	22.71	21.33	19.69	1.38	6.47	1.64	7.69	3.02
April	23.31	21.60	20.11	1.51	6.93	1.69	7.75	3.20
May	25.58	23.96	22.03	1.62	6.76	1.93	8.06	3.55
June	25.86	24.30	22.40	1.56	6.42	1.90	7.82	3.46
July	26.89	25.32	23.27	1.57	6.20	2.05	8.10	3.62
August	26.68	24.89	22.79	1.79	7.19	2.10	8.44	3.89
September	25.02	23.30	21.45	1.72	7.38	1.85	7.94	3.57
October	22.62	21.18	19.69	1.44	6.80	1.49	7.03	2.93
November	21.71	20.25	18.68	1.46	7.21	1.57	7.75	3.03
December	24.32	22.86	21.15	1.46	6.39	1.71	7.48	3.17
1954								
January	$26.82	$25.23	$23.29	$1.59	6.30	$1.94	7.69	$3.53
February	25.26	23.93	22.34	1.33	5.56	1.59	6.64	2.92
March	25.55	24.01	22.30	1.54	6.41	1.71	7.12	3.25
April	26.81	25.26	23.43	1.55	6.14	1.83	7.24	3.38
May	27.48	25.92	23.97	1.56	6.02	1.95	7.52	3.51
June	25.85	24.52	22.78	1.33	5.42	1.74	7.10	3.07
July	25.56	24.22	22.42	1.34	5.53	1.80	7.43	3.14
August	24.84	23.27	21.43	1.57	6.75	1.84	7.91	3.41
September	22.32	20.89	19.23	1.43	6.85	1.66	7.95	3.09
October	20.13	18.85	17.53	1.28	6.79	1.32	7.00	2.60
November	21.48	20.37	18.95	1.11	5.45	1.42	6.97	2.53
December	1915	18.35	17.30	0.80	4.36	1.05	5.72	1.85

TABLE 5.—FOUR LEAN CUTS: Value of Four Lean Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956—Continued

(70 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
1955					Percent		Percent	
January	$18.96	$18.07	$16.87	$0.89	4.93	$1.20	6.64	$2.09
February	18.37	17.52	16.48	0.85	4.85	1.04	5.94	1.89
March	17.49	16.54	15.53	0.95	5.74	1.01	6.11	1.96
April	19.55	18.40	16.99	1.15	6.25	1.41	7.66	2.56
May	20.46	19.36	17.90	1.10	5.68	1.46	7.54	2.56
June	22.67	21.33	19.68	1.34	6.28	1.65	7.74	2.99
July	21.35	20.03	18.35	1.32	6 59	1.68	8.39	3.00
August	20.20	18.92	17.44	1.28	6.77	1.48	7.82	2.76
September	19.92	18.52	17.06	1.40	7.56	1.46	7.88	2.86
October	17.70	16.59	15.51	1.11	6.69	1.08	6.51	2.19
November	16.78	15.88	14.85	0.90	5.67	1.03	6.49	1.93
December	14.72	13.89	12.91	0.83	5.98	0.98	7.06	1.81
1956								
January	$15.24	$14.45	$13.33	$0.79	5.47	$1.12	7.75	$1.91
February	16.82	15.81	14.56	1.01	6.39	1.25	7.91	2.26
March	16.89	15.88	14.63	1.01	6.36	1.25	7.87	2.26
April	18.39	17.26	15.89	1.13	6.55	1.37	7.94	2.50
May	19.24	18.11	16.68	1.13	6.24	1.43	7.90	2.56
June	20.76	19.57	18.02	1.19	6.08	1.55	7.92	2.74
July	20.19	18.97	17.42	1.22	6.43	1.55	8.17	2.77
August	20.21	18.73	17.16	1.48	7.90	1.57	8.38	3.05
September	1954	18.26	16.79	1.28	7.01	1.47	8.05	2.75
October	18.82	17.63	16.32	1.19	6.75	1.31	7.43	2.50
November	17.33	16.40	15.26	0.93	5.67	1.14	6.95	2.07
December	18.74	17.68	16.36	1.06	6.00	1.32	7.47	2.38
Average					6.30		7.49	

Source: Ohio 728 Study carcasses. Selected National Provisioner Daily Market Service Prices.

TABLE 6.—FOUR LEAN CUTS: Value of Four Lean Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956

(160 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
1953					Percent		Percent	
January	$21.42	$20.21	$18.66	$1.21	5.99	$1.55	7.67	$2.76
February	22.72	21.45	19.96	1.27	5.92	1.49	6.95	2.76
March	22.85	21.51	19.88	1.34	6.23	1.63	7.58	2.97
April	23.48	22.03	20.30	1.45	6.58	1.73	7.85	3.18
May	25.51	23.97	22.06	1.54	6.42	1.91	7.97	3.45
June	25.69	24 31	22.41	1.38	5.68	1.90	7.82	3.28
July	26.33	25.07	23.01	1.26	5.03	2.06	8.22	3.32
August	26.75	25.12	23.07	1.63	6.49	2.05	8.16	3.68
September	24.89	23.32	21.38	1.57	6.73	1.94	8.32	3.51
October	22.85	21.34	19.61	1.15	7.08	1.73	8.11	3.24
November	22.04	20.66	19.03	1.38	6.68	1.63	7.89	3.01
December	24.36	22.91	21.17	1.45	6.33	1.74	7.59	3.19
1954								
January	$26.84	$25.36	$23.43	$1.48	5.84	$1.93	7.61	$3.41
February	25.32	23.98	22.20	1.34	5.59	1.78	7.42	3.12
March	25.96	24.36	22.52	1.60	6.57	1.84	7.55	3.44
April	26.99	25.50	23.57	1.49	5.84	1.93	7.57	3.42
May	27.57	26.07	24.08	1.50	5.75	1.99	7.63	3.49
June	25.79	24.64	22.75	1.15	4.67	1.89	7.67	3.04
July	25.53	24.42	22.50	1.11	4.55	1.92	7.86	3.03
August	25.00	23.67	21.76	1.33	5.62	1.91	8.07	3.24
September	22.56	21.23	19.49	1.33	6.26	1.74	8.20	3.07
October	20.32	19.00	17.51	1.32	6.95	1.49	7.84	2.81
November	21.48	20.34	18.87	1.14	5.60	1.47	7.23	2.61
December	19.26	18.39	17.13	0.87	4.73	1.26	6.85	2.13

TABLE 6.—FOUR LEAN CUTS: Value of Four Lean Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956—Continued

(160 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
1955					Percent		Percent	
January	$19.08	$18.25	$16.93	$0.83	4.55	$1.32	7.23	$2.15
February	18.46	17.58	16.31	0.88	5.01	1.27	7.22	2.15
March	17.91	16.87	15.61	1.04	6.16	1.26	7.47	2.30
April	19.75	18.70	17.26	1.05	5.61	1.44	7.70	2.49
May	20.46	19.47	17.99	0.99	5.08	1.48	7.60	2.47
June	22.66	21.46	19.74	1.20	5.59	1.72	8.01	2.92
July	21.54	20.49	18.80	1.05	5.12	1.69	8.25	2.74
August	20.27	19.06	17.56	1.21	6.35	1.50	7.87	2.71
September	20.32	18.88	17.30	1.44	7.63	1.58	8.37	3.02
October	18.05	16.85	15.52	1.20	7.12	1.33	7.89	2.53
November	17.09	16.09	14.92	1.00	6.22	1.17	7.27	2.17
December	14.97	14.20	13.18	0.77	5.42	1.02	7.18	1.79
1956								
January	$15.38	$14.57	$13.48	$0.81	5.56	$1.09	7.48	$1.90
February	17.29	16.27	14.99	1.02	6.27	1.28	7.87	2.30
March	17.56	16.46	15.17	1.10	6.68	1.29	7.84	2.39
April	18.72	17.56	16.16	1.16	6.61	1.40	7.97	2.56
May	19.38	18.27	16.82	1.11	6.08	1.45	7.94	2.56
June	20.97	19.88	18.30	1.09	5.48	1.58	7.95	2.67
July	20.73	19.60	17.98	1.13	5.77	1.62	8.27	2.75
August	20.61	19.13	17.46	1.48	7.74	1.67	8.73	3.15
September	19.93	18.59	17.06	1.34	7.21	1.53	8.23	2.87
October	1925	17.97	16.50	1.28	7.12	1.47	8.18	2.75
November	17.74	16.66	15.42	1.08	6.48	1.24	7.44	2.32
December	18.88	17.76	16.40	1.12	6.31	1.36	7.66	2.48
Average					6.05		7.78	

Source: Ohio Swine Evaluation Station, Fall 1954 Pig Crop. Selected National Provisioner Daily Market Service prices.

TABLE 7.—FIVE PRIMAL CUTS: Value of Five Primal Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Throught December 1956

(70 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
					Percent		Percent	
1953								
January	$26.38	$25.23	$23.99	$1.15	4.56	$1.24	4.91	$2.39
February	28.00	26.82	25.58	1.18	4.40	1.24	4.62	2.42
March	27.89	26.71	25.49	1.18	4.42	1.22	4.57	2.40
April	28.67	27.33	26.15	1.34	4.90	1.18	4.32	2.52
May	31.78	30.35	29.03	1.43	4.71	1.32	4.35	2.75
June	32.86	31.51	30.30	1.35	4.28	1.21	3.84	2.56
July	34.31	32.98	31.59	1.33	4.03	1.39	4.21	2.72
August	34.03	32.46	31.08	1.57	4.84	1.38	4.25	2.95
September	32.81	31.32	30.27	1.49	4.76	1.05	3.35	2.54
October	27.90	26.64	25.53	1.26	4.73	1.11	4.17	2.37
November	27.32	26.02	25.00	1.30	5.00	1.02	3.92	2.32
December	30.89	29.66	28.49	1.23	4.15	1.17	3.94	2.40
1954								
January	$34.50	$33.17	$31.83	$1.33	4.01	$1.34	4.04	$2.67
February	32.71	31.62	30.68	1.09	3.45	0.94	2.97	2.03
March	32.87	31.52	30.45	1.35	4.28	1.07	3.39	2.42
April	34.56	33.26	32.14	1.30	3.91	1.12	3.37	2.42
May	34.80	33.48	32.19	1.32	3.94	1.29	3.85	2.61
June	32.45	31.36	30.09	1.09	3.48	1.27	4.05	2.36
July	30.90	29.72	28.41	1.18	3.97	1.31	4.41	2.49
August	30.89	29.50	28.27	1.39	4.71	1.23	4.17	2.62
September	27.63	26.36	25.22	1.27	4.82	1.14	4.32	2.41
October	24.64	23.52	22.55	1.12	4.76	0.97	4.12	2.09
November	26.69	25.76	24.76	0.93	3.61	1.00	3.88	1.93
December	24.15	23.55	22.76	0.60	2.55	0.79	3.35	1.39

TABLE 7.—FIVE PRIMAL CUTS: Value of Five Primal Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956—Continued

(70 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
1955					Percent		Percent	
January	$23.61	$22.90	$22.03	$0.71	3.10	$0.87	3.80	$1.58
February	22.65	21.94	21.27	0.71	3.24	0.67	3.05	1.38
March	21.24	20.41	19.71	0.83	4.07	0.70	3.43	1.53
April	23.85	22.84	21.82	1.01	4.42	1.02	4.47	2.03
May	24.33	23.36	22.21	1.10	4.76	1.15	4.92	2.25
June	27.06	25.85	24.60	1.21	4.68	1.25	4.84	2.46
July	25.53	24.34	23.05	1.19	4.89	1.29	5.30	2.48
August	24.18	23.03	21.94	1.15	4.99	1.09	4.73	2.24
September	24.10	22.82	21.79	1.28	5.61	1.03	4.51	2.31
October	20.99	19.99	19.23	1.00	5.00	0.76	3.80	1.76
November	19.83	19.04	18.23	0.79	4.15	0.81	4.25	1.60
December	17.65	16.92	16.16	0.73	4.31	0.76	4.49	1.49
1956								
January	$17.90	$17.20	$16.29	$0.70	4.07	$0.91	5.29	$1.61
February	19.45	18.54	17.49	0.91	4.91	1.05	5.66	1.96
March	19.28	18.34	17.30	0.94	5.13	1.04	5.67	1.98
April	21.20	20.16	19.08	1.04	5.16	1.08	5.36	2.12
May	22.18	21.14	19.99	1.04	4.92	1.15	5.44	2.19
June	24.09	23.00	21.75	1.09	4.74	1.25	5.43	2.34
July	23.52	22.40	21.17	1.12	5.00	1.23	5.49	2.35
August	23.88	22.52	21.29	1.36	6.04	1.23	5.46	2.59
September	23.27	22.09	21.06	1.18	5.34	1.03	4.66	2.21
October	21.94	20.82	19.80	1.12	5.38	1.02	4.90	2.14
November	20.89	20.08	19.21	0.81	4.03	0.87	4.33	1.68
December	22.91	21.99	21.05	0.92	4.18	0.94	4.27	1.86
Average					4.47		4.37	

Source: Ohio 728 Study carcasses. Selected National Provisioner Prices.

TABLE 8.—Five Primal Cuts: Value of Five Primal Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956

(160 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
					Percent		Percent	
1953								
January	$26.28	$25.24	$23.73	$1.04	4.12	$1.51	5.98	$2.55
February	27.82	26.76	25.19	1.06	3.96	1.57	5.87	2.63
March	27.89	26.77	25.20	1.12	4.18	1.57	5.86	2.69
April	28.65	27.43	25.78	1.22	4.45	1.65	6.02	2.87
May	31.48	30.22	28.41	1.26	4.17	1.81	5.99	3.07
June	32.43	31.37	29.57	1.06	3.38	1.80	5.74	2.86
July	33.53	32.58	30.62	0.95	2.92	1.96	6.02	2.91
August	33.82	32.52	30.57	1.30	4.00	1.95	6.00	3.25
September	32.36	31.14	29.31	1.22	3.92	1.83	5.88	3.05
October	28.07	26.74	25.05	1.33	4.97	1.69	6.32	3.02
November	27.43	26.29	24.75	1.14	4.34	1.54	5.86	2.68
December	30.78	29.60	27.94	1.18	3.99	1.66	5.61	2.84
1954								
January	$34.36	$33.17	$31.32	$1.19	3.59	$1.85	5.58	$3.04
February	32.57	31.54	29.86	1.03	3.27	1.68	5.33	2.71
March	33.03	31.73	29.96	1.30	4.10	1.77	5.58	3.07
April	34.49	33.35	31.51	1.14	3.42	1.84	5.52	2.98
May	34.66	33.49	31.58	1.17	3.49	1.91	5.70	3.08
June	32.31	31.40	29.56	0.91	2.90	1.84	5.86	2.75
July	30.70	29.84	27.98	0.86	2.88	1.86	6.23	2.72
August	30.90	29.76	27.94	1.14	3.83	1.82	6.12	2.96
September	27.70	26.58	24.92	1.12	4.21	1.66	6.25	2.78
October	24.74	23.59	22.14	1.15	4.87	1.45	6.15	2.60
November	26.58	25.64	24.23	0.94	3.67	1.41	5.50	2.35
December	24.29	23.57	22.34	0.72	3.05	1.23	5.22	1.95

TABLE 8.—Five Primal Cuts: Value of Five Primal Cuts by Grades, per One Hundred Pounds of Chilled Carcass, and Differential Between Grades, 135-155 Pound Carcasses, January 1953 Through December 1956—Continued

(160 Carcasses)

Year and month	Grade one value	Grade two value	Grade three value	Differential				
				1 over 2	Percent grade two value	2 over 3	Percent grade two value	1 over 3
					Percent		Percent	
1955								
January	$23.69	$23.03	$21.76	$0.66	2.87	$1.27	5.51	$1.93
February	22.63	21.94	20.72	0.69	3.14	1.22	5.56	1.91
March	21 57	20.68	19.46	0.89	4.30	1.22	5.90	2.11
April	23.94	23.07	21.68	0.87	3.77	1.39	6.03	2.26
May	24.25	23.42	21.98	0.83	3.54	1.44	6.15	2.27
June	26.92	25.94	24.25	1.00	3.86	1.67	6.44	2.67
July	25.59	24.72	23.09	0.87	3.52	1.63	6.59	2.50
August	24.09	23.06	21.62	1.03	4.47	1.44	6.24	2.47
September	24.33	23.09	21.56	1.24	5.37	1.53	6.63	2.77
October	21.22	20.17	18.88	1.05	5.21	1.29	6.40	2.34
November	20.09	19.22	18.07	0.87	4.53	1.15	5.98	2.02
December	17.85	17.19	16.21	0.66	3.84	0.98	5.70	1.64
1956								
January	$17.98	$17.28	$16.22	$0.70	4.05	$1.06	6.13	$1.76
February	19.88	18.96	17.71	0.92	4.85	1.25	6.59	2.17
March	19.87	18.88	17.62	0.99	5.24	1.26	6.67	2.25
April	21.42	20.39	19.03	1.03	5.05	1.36	6.67	2.39
May	22.21	21.24	19.82	0.97	4.57	1.42	6.69	2.39
June	24.20	23.25	21.71	0.95	4.09	1.54	6.62	2.49
July	23.93	22.94	21.38	0.99	4.32	1.56	6.80	2.55
August	24.00	22.83	21.21	1.17	5.12	1.62	7.10	2.79
September	23.46	22.31	20.84	1.15	5.15	1.47	6.59	2.62
October	22.22	21.08	19.65	1.14	5.41	1.43	6.78	2.57
November	21.23	20.30	19.09	0.93	4.58	1.21	5.96	2.14
December	22.92	21.98	20.68	0.94	4 28	1.30	5.91	2.24
Average					4.10		6.08	

Source: Ohio Swine Evaluation Station, Fall 1954 Pig Crop. Selected National Provisioner Daily Market Service prices.

We cannot extend the assumption to include the value of fat by grades. We might disregard fat as an important factor because of its declining price status and because the differences in fat value between grades may account for only a very small part of the total difference in value between grades. But, if an accurate formula is the objective, fat cannot be excluded from consideration at such an early point.

This is not the primary objection to the procedure. Aside from the fact that belly has not yet been taken into consideration, the effect of which would be much the same as that of fat, there remains a definite weakness. **The main fallacy in attempting to use such a method is that, while a dynamic and changing relationship continually exists between the relative values of the various five primal cuts and such changing relationships have an important influence upon an overall differential, the above method holds this relationship constant at the time the sample was drawn and under the price-value relationship which happened to exist during the period studied.**

At best, then, were the formula to stop here, it would only offer a crude means of estimating value differences on a live basis. Although this might be a noticeable improvement upon present undiscriminatory buying practices, it is obvious that such a method would be subject to serious limitations, being neither dynamic nor wholly accurate.

With an array of values such as is exhibited in Tables 5 through 8 **there can remain no doubt that a value differential is to be expected without exception whenever accurate live grading is carried out.** But one major question remains unanswered. Is there any reason to expect a similar differential to recur with the re-appearance of a price situation comparable to one that existed at some time in the past? Because Grade 2 hogs sold for $20.00 at some time in the past and the total differential at that time was $2.00, shall we expect to find a total differential of $2.00 on the next occasion of Grade 2 prices at $20.00?

The Consistency of the Differential

Simple correlation and regression analysis, plotted for 230 carcasses and presented in Charts B and C, indicates the degree of consistency of the Grade 1—Grade 3 over changing price conditions. Value of Grade 2 four lean cuts per one hundred pounds of carcass was plotted on the X axis and the difference between the Grade 1 and Grade 3 value of four lean cuts per hundred pounds of carcass was plotted on the Y axis.

At the outset of the research it was believed that the belly cut could not be used in developing an accurate formula because of the great variance within grade that was characteristic of the cut, due both to

varying cutting practices between packing plants and to inherent characteristics of the belly. This correlation analysis would seem to justify such an assumption because the coefficient of determination was noticeably lower in analysis of five primal cuts than in four lean cuts. This, however, would be a rather hasty conclusion for it does not necessarily follow that belly be omitted in the interest of formula accuracy for this reason alone. First, although the coefficient of determination may be lower when belly is included, it may be that greater accuracy of result would still be realized by including belly since a larger portion of total carcass value would be actually known. Second, it might be concluded that the only thing this analysis proves is that there is some degree of consistency in variance of the differential, **but the differential may not be completely a function of changes in value of certain portions** of the Grade 2 carcass.

A Basic Principle

A general conclusion may be drawn from this analysis: the differential can be stated partly in terms of a function of changes in value of four lean cuts or five primal cuts in a Grade 2 carcass. Again, this does not mean that a formula can be developed on that basis alone because this would force the varying relative price and value importance of the five primal cuts to remain constant at the point where it happened to exist when the analysis was made. An accurate formula would have to take this varying relationship into account and evaluate it each time the formula was employed.

PERCENT OF TOTAL CARCASS VALUE

To work with less than the value of the entire carcass introduced to necessity of determining what percent of total value was involved since data would have to be converted into value for the entire carcass before it could be expressed on a live weight basis. In arriving at a solution to this percent of total value problem, the first step was to compute value data for all miscellaneous cuts in order to arrive at total cut out values for each graded carcass in the sample.

(1) The miscellaneous cuts of the sample were divided into three groups representing the grades of hogs from which they came. The weight data for each type of miscellaneous cut was then averaged by grades. The result was an average weight by grades for fat (including leaf), lean trim, spareribs, jowls, neckbones, tails and feet.

(2) Prices were then selected from the National Provisioner "Yellow Sheet" to apply to the weights. The prices were averaged for the second week of each month of the period studied for the following

TABLE 9.—Monthly Average Percent of Totai Carcass Value in Four Lean Cuts, Five Primal Cuts, and Five Primal Cuts Plus Fat, 563 Carcasses Weighing 135-155 Pounds for the Period January, 1953 Through December, 1956

(195-220 Pounds Live Weight)

	Grade 1	Grade 2	Grade 3
Four Lean Cuts			
January	69.0	66.9	64.6
February	70.5	68.4	66.1
March	71.1	68.9	66.5
April	70.7	68.5	66.0
May	71.6	69.4	66.9
June	71.8	69.9	67.4
July	72.1	70.0	66.7
August	71.4	68.9	65.4
September	69.6	67.0	63.3
October	70.3	67.8	64.6
November	69.9	67.6	64.5
December	69.0	66.7	63.8
Five Primal Cuts			
January	86.2	85.2	84.1
February	86.1	85.0	83.9
March	85.8	84.6	83.4
April	85.8	84.7	83.4
May	86.3	85.2	83.8
June	87.2	86.2	85.0
July	86.8	85.7	84.3
August	86.7	85.4	83.9
September	85.3	83.9	82.3
October	84.0	82.6	80.9
November	84.9	83.7	82.1
December	85.1	83.9	82.4
Five Primal + Fat			
January	91.4	91.3	91.7
February	91.5	91.4	91.8
March	91.3	91.2	91.6
April	91.6	91.5	91.9
May	92.0	91.9	92.3
June	92.1	92.1	92.4
July	92.3	92.0	91.5
August	92.6	92.3	91.8
September	91.9	91.6	91.1
October	91.0	90.8	90.3
November	91.4	91.2	90.8
December	91.8	91.6	91.2

Source: Original data.

cuts: neckbones; 3 to 5 pound spareribs; 80.0 percent lean trim; square jowls; tails; front feet; and loose rendered pork fat.[6] These prices were applied to the average weights by grades.

(3) Resulting miscellaneous cut values were then added to five primal cut values which had been compiled previously. From such data which showed values for four lean cuts, belly, fat, and remaining miscellaneous cuts, the percent of total carcass value was computed for the four lean cuts, the five primal cuts, and the five primal cuts plus fat for each carcass. The data are summarized by months for the period January, 1953 to December, 1956 in Table 9.

Review of Table 9 shows the relative advantages of constants as progressively more of the hog carcass becomes a known value. Percent of total carcass value in the **four lean cuts** fluctuates widely, and offers no dependable seasonal pattern from one year to another. Quite possibly such constants would no longer be representative a few years in the future. Lacking predictability, they do not appear satisfactory as constants to be depended upon.

Percent of total carcass value in the **five primal cuts** offers much greater dependability and it would appear, on the basis of Table 9, such a constant might be quite dependable from year to year, although considerable fluctuation is in evidence from one month to the next.

Percent of total carcass value in **five primal cuts plus fat** seems to offer a good series of constants for conversion to liveweight figures if incorporated into a formula. Cyclically as well as seasonally, the percentages display a high degree of stability.

DEVELOPING THE FORMULA

A Method to Account for the Relative Importance of Each Price

It has been pointed out that a simple percentage increase or decrease in the quoted price would not lead to an accurate estimate of Grade 1 and Grade 3 prices. Too many changing variables relating to price and weight cast their influence to permit success from such a static procedure.

It had been recognized that, to develop an accurate formula wholesale price fluctuations must be taken into account each time the formula was used, thus giving credit to the relative importance of each price at the time of application.

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[6]Since raw fat will render about eighty pounds loose lard per hundred pounds raw fat, the loose rendered fat price was multiplied by .80 in order to arrive at a price more representative of raw fat.

Therefore, the most appropriate means of thoroughly accounting for such complexity was a value based upon weighted averages of price and constituent cut weights because: (1) it would capture the present situation exactly, and (2) it would not depend upon a questionable explanation of a pattern or system in the fluctuation of 15 price quotations moving across time in various directions. Finally, such a procedure would be simple and practical for use in the trade.

The Procedure Outline Sheet

With this possibility in mind, a procedure outline sheet such as is displayed in Chart D was developed. Such a sheet outlined all the steps it was thought would be required to arrive at a differential for live-graded market hogs weighing between 200 and 220 pounds.

Assumptions Regarding the Use of an Outline Sheet

Certain assumptions are established as prerequisities to the use of the outline sheet. They are: (1) the buyer and/or the seller has the ability to grade live hogs or has the hired skill to perform such duties accurately, (2) the buyer/or the seller has access to the National Provisioner Daily Market Service "Yellow Sheet", or some equally acceptable source of adequate wholesale quotations, (3) the buyer and /or the seller has access to the Chicago Semi-weekly Livestock Market Report published by the USDA Market News Service, Livestock Division. This is not essential, but serves as a basis for comparison with formula-computed prices, (4) the buyer and/or the seller has on hand certain necessary tables of constants.

With these data available, the buyer is prepared to use the form displayed as Chart D. The first section of the form will completely take into account the relative importance or position of all prices for all weight groups of each of the five primal cuts. The manner in which prices are established in the first section of the outline involves the use of the latest National Provisioner price quotations and an essential table of constants which is presented in Table 10. Table 10 was developed on the basis of the complete 563 hog carcass sample. The development of the various supporting data for the formula will be taken up first, followed by an explanation of their use.

The First Table of Constants

On the basis of 1,126 hams and the same number of loins, picnics, butts, bellies and shoulders, assorted by grades, Table 10 is designed to show what may be expected in the weight distribution of these cuts in the three grades of live hogs weighing between 195 and 220 pounds. For example, on the basis of the sample, the buyer may know that no

TABLE 10.—Percent of the Five Primal Cuts in Various Weight-Price Groups by Grades, 563 Carcasses of 135-155 Pounds, Chilled

(195-220 Pounds Live Weight)

Cut	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Ham			
10–12	00.00	1.30	15.67
12–14	14.98	57.62	82.84
14–16	76.43	40.71	1.49
16–18	8.59	0.37	0.00
Total	100.00	100.00	100.00
Loin			
Under 12	61.23	97.40	100.00
12–16	38.77	2.60	0.00
Total	100.00	100.00	100.00
Picnic			
4– 6	0.00	12.07	31.58
6– 8	88.64	86.21	68.42
8–10	11.36	1.72	0.00
Total	100.00	100.00	100.00
Butt			
4– 8	100.00	100.00	100.00
8–12	0.00	0.00	0.00
Total	100.00	100.00	100.00
Shoulder			
Under 16	100.00	100.00	100.00
16 and up	0.00	0.00	0.00
Total	100.00	100.00	100.00
Belly			
8–10	25.33	1.86	1.49
10–12	68.28	70.45	37.31
12–14	5.95	27.32	58.96
14–16	0.44	0.37	2.24
Total	100.00	100.00	100.00

Source: Total sample.

195-220 pound Grade 1 hogs have hams weighing between 10 and 12 pounds; that 14.98 percent of the hogs have hams weighing between 12 and 14 pounds; that 76.43 percent have hams weighting 14-16 pounds; and that 8.59 percent of them have hams in the 16 to 18 pound category.

This is the first table of constants. It supports step one of the outline.

The purpose of this table of constants is to offer accurate weights to enable the buyer to arrive at accurate weighted wholesale prices for all cuts on the basis of the most recent price quotation available. To compute such weighted prices, the buyer must refer to a source comparable to the National Provisioner "Yellow Sheet", consulting the Fresh or Fresh Freezer Accumulation price for Skinned Hams on that date. The buyer will multiply the price quoted for each weight by the appropriate constant in Table 10 for the corresponding weight. By this means he will adequately account for the relative importance of each price in relation to the relative importance of each weight category of any cut in each of the three grades of live hogs.

The Introduction of Fat and the Second Table of Constants

The question arose: was there legitimate basis for the inclusion of fat as a known factor in computing the formula since it was a minor factor at best? To answer the question, this hypothesis was posed. If a strong relationship existed between the value of fat (an unknown factor in computing the formula) and the value of the five primal cuts (a known factor in computing the formula), there would be little need to incorporate the value of fat as a known value. For, in this case, movement of fat value would correspond to the movement or change in value of the five primal cuts, and its influence in determining a differential would be negligible.

To this end, a correlation analysis between the value of fat and the value of five primal cuts was computed at each grade level. The resulting r^2 (coefficient of determination) for Grade 1 was 37.22; for Grade 2 was 37.44; and for Grade 3 was 38.12, thus refuting the hypothesis. Since only a little more than 35.0 percent of the variation in fat value could be explained in terms of variations or changes in the value of the five primal cuts, the unexplained variation of fat value could have an influence detrimental to the accuracy of the formula.

We have seen that the differential between the values of the four lean cuts, by grades, cannot be taken as the true differential for the total carcass because the size and value of belly would be unknown and would thus remain undifferentiated by grades. It is inaccurate to allow this to occur because the weight of the belly increases as grade progresses from 1 to 3, thus narrowing the differential. This is true also of fat. While the amount of fat increases from Grade 1 to Grade 3, the price per pound does not decline as weight increases as is true of the price of other cuts. The only justification for the exclusion of fat thus far has

TABLE 11.—Weight Percentage Contributed by Each Cut to One Hundred Pounds of Five Primal Cuts and Fat, by Grade, 563 Carcasses Weighing 135-155 Pounds

(195-220 Pounds Live Weight)

Cut	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Ham	22.87	21.31	19.78
Loin	18.03	16.60	15.25
Picnic	11.25	10.50	9.77
Butt	8.71	7.95	7.04
Belly	16.87	17.76	19.00
Fat	22.27	25.88	29.16
Total	100.00	100.00	100.00

Source: Original data, total sample.

not been lack of recognition of this point, but the belief that differences in the value of fat were unimportant between grades when the total value of fat composed such a small percentage of total carcass value. But this, it seems, is untrue.

There is, however, further and more important justification for the inclusion of fat. **Such justification is found in the fact that, since percent of total carcass value is a predicted factor, predicted on the basis of monthly constants, the inclusion of fat allows such a factor to become much more constant both seasonally and cyclically and therefore much more predictable.**

Table 11 is an essential table of constants in support of Step Two in the outline. The table shows, for example, that for every 100 pounds of Grade 1 five primal cuts plus fat, hams accounted for 22.87 percent (22.87 pounds) of that weight, loins, 18.03 percent (18.03 pounds), etc. A more comprehensive discussion of this table will come on later pages.

By-passing the Dressing Percentage Problem and the Third Table of Constants.

In view of the rather serious disadvantages discovered regarding dressing percentage when either the sample approach or the quotation approach was used, the possibility of by-passing the entire dressing percentage problem was investigated. Immediately the idea of developing constants based upon 100 pounds of liveweight seemed favorable. To develop such constants would mean that all data, once multiplied by liveweight constant would be immediately stated in terms of one

TABLE 12.—Pounds of Four Lean Cuts, Five Primal Cuts, and Five Primal Cuts Plus Fat, by Grades, in One Hundred Pounds Live Weight of 195-220 Pound Market Hogs

(135-155 Pounds Carcass Weight)

Portion of total carcass	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Four Lean Cuts	39.12	36.32	33.70
Five Primal Cuts	49.97	47.74	45.82
Five Primal Cuts Plus Fat	64.27	64.27	64.42

Source: Original data, total sample.

hundred pounds of live hog. Such constants, based upon one hundred pounds liveweight, were computed as a third table of constants in support of Step Three of the outline and compiled as presented in Table 12. The reader will note that this table allows the formula used to apply any of the three approaches discussed thus far.[7]

The Fourth Table of Constants

Table 9, which appeared on page 27, best represents the fourth and final table of constants required for completing computations on the formula outline.

THE SUGGESTED FINAL FORM

The purpose of this section is to present a concise sample of the data necessary for convenient computation of the formula, presented in a manner suitable for acceptance by prospective users in the meat industry. To gain such acceptance the data would have to be precise, easy to understand, quick to compute, and otherwise promote every possible convenience. It is with these objectives in mind that the following outline sheet and supporting tables of constants have been designed. Such material as is presented in the tables of constants could be printed on one cardboard plate and the outline sheet could be in mimeograph form. All computations could be done and all necessary entries made on a mimeographed copy of the outline which, after its current usefulness had expired, could be placed on file until its value as a reference source had also expired.

[7]That is, the four lean cut approach, the five primal cut approach, or the five primal cut plus fat approach.

Each of the required steps has been entered on the outline form. In actual practice, a written explanation of the procedure might accompany each phase of the computation and could be entered adjacent to each step of the outline sheet.

The five primal cuts plus fat formula results in the greatest accuracy as will be shown in the following section. The outline sheet shown in Chart E is designed exclusively for that approach, but other outline sheets similar in design could be arranged for alternative formulae, or a multiple sheet might be planned which would allow space for any formula approach desired.[8]

The reader will note that only the bottom row of figures pertains to the present discussion and the formula approach using the five primal cuts plus fat. The two top rows of figures may be used for either the four lean cut approach or the five primal cut approach, and indeed are used in that context in forming the basis for Step Three of Charts F and G in the appendix.

To facilitate explanation of the procedure here presented, Chart E outlines the complete computing procedure on the basis of wholesale prices selected from the National Provisioner Daily Market Service for Thursday, November 15, 1956. Prices on that date were quoted as follows: (prices are expressed in cents)

Fresh Skinned Hams:
10–12 pounds—41.25 cents
12–14 pounds—40.50
14–16 pounds—39.50
16–18 pounds—39.50

Regular Loins:
Under 12 pounds—34.00 cents
12–16 pounds—34.75

Fresh Picnics:
4– 6 pounds—21.50 cents
6– 8 pounds—20.00
8–10 pounds—20.50

Boston Butts:
4– 8 pounds—27.75 cents

Fresh Bellies:
8–10 pounds—24.50 cents
10–12 pounds—24.25
12–14 pounds—23.00
14–16 pounds—19.50

Dry Rendered Lard (Open Market Quotation):
12.75 (x80.0 percent = 10.20)

[8]Similar form sheets accommodating computations for the four lean cuts and the five primal cuts approach are presented in the appendix.

For the purpose of formula computation, the reader will recall, the price of dry rendered lard is multiplied by .80 in order to derive a price more representative of raw fat.

The first step in computing the formula would be to enter the price coefficients under Step One which result from the multiplication of the appropriate price quotations by the proper constants listed in Table 13.

TABLE 13.—Percent of the Five Primal Cuts in Various Weight-Price Groups, by Grades, in 563 Chilled Carcasses Weighing 135-155 Pounds

(195-220 Pounds Live Weight)

Cut	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Ham			
10–12	00.00	1.30	15.67
12–14	14.98	57.62	83.84
14–16	76.43	40.71	1.49
16–18	8.59	0.37	0.00
Total	100.00	100.00	100.00
Loin			
Under 12	61.23	97.40	100.00
12–16	38.77	2.60	0.00
Total	100.00	100.00	100.00
Picnic			
4– 6	0.00	12.07	31.58
6– 8	88.64	86.21	68.42
8–10	11.36	1.72	0.00
Total	100.00	100.00	100.00
Butt			
4– 8	100.00	100.00	100.00
8–12	0.00	0.00	0.00
Total	100.00	100.00	100.00
Shoulder			
Under 16	100.00	100.00	100.00
16 and up	0.00	0.00	0.00
Total	100.00	100.00	100.00
Belly			
8–10	25.33	1.86	1.49
10–12	68.28	70.45	37.31
12–14	5.95	27.32	58.96
14–16	0.44	0.37	2.24
Total	100.00	100.00	100.00

Source: Original data

For example, the 12-14 pound ham quotation is 40.50 cents. This price, multiplied by 14.98, (From Table 13) the constant for Grade 1 hams weighing 12-14 pounds, results in the coefficient $.0607 which has been entered for 12-14 pound hams in Chart E. Following the same procedure, the coefficients for all prices could be entered in the space provided in Step One. After the coefficients have been recorded, they may be totaled and the sum recorded in the space provided. Such totals represent weighted prices for each cut by Grades 1, 2, and 3.

These totals are then applied to the appropriate constants in Table 14. For example, the Grade 1 weighted price of hams is $.3965. This price, multiplied by 22.87 (See Table 14), which is the constant percent contribution by ham to one hundred pounds of five primal cuts and fat, results in a value of $9.07 (Grade 1) for 22.87 pounds of ham. The result is entered in the space provided on the outline under Step Two, Chart E. When all entries have been made in Step Two, they are summed and the total represents the weighted value of one hundred pounds of five primal cuts and fat, by grades.

TABLE 14.—Percent of Weight Contributed by Each Cut to One Hundred Pounds of Five Primal Cuts and Fat, by Grade, 563 Carcasses Weighing 135-155 Pounds

(195-220 Pounds Live Weight)

Cut	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Ham	22.87	21.31	19.78
Loin	18.03	16.60	15.25
Picnic	11.25	10.50	9.77
Butt	8.71	7.95	7.04
Belly	16.87	17.76	19.00
Fat	22.27	25.88	29.16
Total	100.00	100.00	100.00

Source: Original date.

The third table of constants, Table 15, summarizes the actual weight of four lean cuts, five primal cuts, and five primal cuts plus fat in one hundred pounds of live 195-220 pound hogs. Since the outline presented here is designed to accommodate only the five primal cuts plus fat formula, the proper constants from Table 15 have been entered directly on the outline sheet in Step Three, which is self explanatory.

TABLE 15.—Pounds of Four Lean Cuts, Five Primal Cuts, and Five Primal Cuts Plus Fat, by Grades, in One Hundred Pounds Live Weight of 195-220 Pound Market Hogs

(135-155 Pounds Carcass Weight)

Portion of total carcass	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent
Four Lean Cuts	39.12	36.32	33.70
Five Primal Cuts	49.97	47.74	45.82
Five Primal Cuts Plus Fat	64.27	64.27	64.42

Source: Original data.

All that is required is to enter the result of Step Two, perform the multiplication and enter the value of the actual number of pounds of five primal cuts and fat per one hundred pounds liveweight.

The only computation remaining which is essential to the determination of the formula is made in Step Four. Here, the final entry of Step Three is recorded in the space provided, division by the appropriate percent for each month by Grade 1, 2, and 3, of total carcass value (gained from the fourth table of constants), Table 16 is made and the entry of live wholesale value per hundredweight is made.

Although the packer operating margin (found in each issue of the weekly bulletin published by the USDA Market News Service, Livestock Division) may be subtracted from this final entry, it will have no bearing on the outcome of the differential because the same dollar amount would be subtracted from each grade.

Thus, the differences between the Grade 1 and Grade 2 and between the Grade 2 and Grade 3 wholesale value per hundred pounds liveweight, as recorded in the final entry of Step Four, represent the differentials as computed on this basis.

Thus, the positive differential to be paid for Grade 1 hogs for the week following November 15, 1956, would be $0.62 ($18.49 minus $17.87) and the negative differential for the Grade 3 hog would be $0.62 ($17.87 minus $17.25) for the same period.

THE RELIABILITY OF THE DIFFERENTIAL

Accompanying Tables 17 and 18 summarize tests conducted on the accuracy of the formula, which was tested at $1.00 intervals over the wide range of prices that occurred during the four year period studied. Selections were made from the USDA daily or semi-weekly price quotations for 180-220 pound barrows and gilts at Chicago. The prices were

TABLE 16.—Monthly Average Percent of Total Carcass Value in Four Lean Cuts, Five Primal Cuts, and Five Primal Cuts Plus Fat, 563 Carcasses Weighing 135-155 Pounds for the Period January, 1953 Through December, 1956

(195-220 Pounds Live Weight)

	Grade 1	Grade 2	Grade 3
Four Lean Cuts			
January	69.0	66.9	64.6
February	70.5	68.4	66.1
March	71.1	68.9	66.5
April	70.7	68.5	66.0
May	71.6	69.4	66.9
June	71.8	69.9	67.4
July	72.1	70.0	66.7
August	71.4	68.9	65.4
September	69.6	67.0	63.3
October	70.3	67.8	64.6
November	69.9	67.6	64.5
December	69.0	66.7	63.8
Five Primal Cuts			
January	86.2	85.2	84.1
February	86.1	85.0	83.9
March	85.8	84.6	83.4
April	85.8	84.7	83.4
May	86.3	85.2	83.8
June	87.2	86.2	85.0
July	86.8	85.7	84.3
August	86.7	85.4	83.9
September	85.3	83.9	82.3
October	84.0	82.6	80.9
November	84.9	83.7	82.1
December	85.1	83.9	82.4
Five Primal Cuts + Fat			
January	91.4	91.3	91.7
February	91.5	91.4	91.8
March	91.3	91.2	91.6
April	91.6	91.5	91.9
May	92.0	91.9	92.3
June	92.1	92.1	92.4
July	92.3	92.0	91.5
August	92.6	92.3	91.8
September	91.9	91.6	91.1
October	91.0	90.8	90.3
November	91.4	91.2	90.8
December	91.8	91.6	91.2

Source: Original data.

selected at approximately $1.00 intervals, and taken at periods closely corresponding to the second week of each month for which National Provisioner wholesale prices had been accumulated for the study. Chicago prices were not selected to represent the standard for which formula accuracy would be judged, but only to establish the approximate $1.00 interval dates.

The standard for judging formula accuracy of each of the three alternative approaches shown in Tables 17 and 18 was total cut out value of the carcasses, computed with the wholesale prices used for the study. These two tables show the percent of times each formula approach resulted in a per-hundredweight wholesale value that was

TABLE 17.—Percent of Times Each Formula Alternative Resulted in a Price per Hundredweight Within Fifty Cents of Total Cut-Out Value and Within Ten Cents of the Differential Between Computed per Hundredweight Value of Each Grade, 563 Carcasses

(When Chicago Price Quotation Ranged from $11.32 to $19.00)

Portion of total carcass	Price			Differential	
	Grade 1	Grade 2	Grade 3	1-2	2-3
	Percent	Percent	Percent	Percent	Percent
Total Cut-Out Value	100.00	100.00	100.00	100.00	100.00
Five Primal Cuts-Fat	100.00	100.00	100.00	100.00	100.00
Five Primal Cuts	100.00	100.00	88.89	55.56	00.00
Four Lean Cuts	44.44	33.33	22.22	77.78	00.00

Source: Original data.

TABLE 18.—Percent of Times Each Formula Alternative Resulted in a Price per Hundredweight Within Fifty Cents of Total Cut-Out Value and Within Ten Cents of the Differential Between Computed per Hundredweight Value of Each Grade, 563 Carcasses

(When Chicago Price Quotation Ranged from $20.17 to $27.15)

Portion of total carcass	Price			Differential	
	Grade 1	Grade 2	Grade 3	1-2	2-3
	Percent	Percent	Percent	Percent	Percent
Total Cut-Out Value	100.00	100.00	100.00	100.00	100.00
Five Primal Cuts-Fat	62.50	87.50	100.00	75.00	62.50
Five Primal Cuts	37.50	62.50	75.00	62.50	00.00
Four Lean Cuts	25.00	25.00	12.50	87.50	00.00

Source: Original data.

within 50¢ of the actual per-hundredweight wholesale value of the carcass as determined by computations of total carcass value. The tables further show the percent of times the residual intergrade differential as determined by the formula alternatives was within 10¢ of the true differential as determined by computations of total carcass value.

Table 17 presents the accuracy of the formula alternatives when Chicago prices ranged between $11.32 and $19.00. A review of Table 18, shows the formula accuracy when Chicago prices ranged from $20.17 to $27.15, that accuracy decreased as price per hundredweight increased. This is because some percentage of error is expected to exist. The same percentage of error when high prices are involved will result in a larger dollars and cents, or actual error, than would have occurred had prices been lower. For example, a 5.0 percent error on $10.00 hogs would have been 50¢, which falls within the limits prescribed previously for acceptable accuracy. But a 5.0 percent error on $20.00 hogs is $1.00, which does not fall within the limits prescribed for acceptable accuracy.

APPENDIX

This bulletin has concerned itself only with an explanation of the procedure involved for computation of the formula by the five primal cut plus fat approach. The reason for such limitation was because the greatest accuracy generally resulted with that method, as Tables 17 and 18 indicated.

The formula may be computed, however, by exactly the same procedure when either the four lean cut or the five primal cut approach is employed. The only change required is that another table be substituted for Table 14, the second table of constants. The necessary table for substitution, which shown below, is different only in the respect that the percentage distribution is changed because fat is not included.

Charts F and G present, respectively, the outline and computations involved in computing the formula by the four lean cut and five primal cut approach. The reader will note that the outline form itself, is, in each case, identical to that used in Chart E, except that the item "Fat" is not included in Chart G, and "Belly" and "Fat" are both omitted in Chart F. These changes constitute the necessity for altering the second table of constants as has been done by substituting Table 19 for Table 14. The reader will further note that, as for the computations themselves, on Charts E, F, and G, all are based upon November 15, 1956, prices. Step One is identical on all charts. Changes in Step Two cause resultant changes in **results** of Steps Three and Four, but do not involve any changes in procedure at all.

TABLE 19 (Substitute for Table 14).—Weight (Percentage) Contributed by Each Cut to 100 Pounds of Four Lean Cuts or Five Primal Cuts, by Grades, 563 Carcasses Weighing 135-155 Pounds

(195-220 Pounds Live Weight)

Cut	Four Lean Cuts			Five Primal Cuts		
	Grade 1	Grade 2	Grade 3	Grade 1	Grade 2	Grade 3
	Percent	Percent	Percent	Percent	Percent	Percent
Ham	37.55	37.86	38.14	29.40	28.79	27.91
Loin	29.67	29.40	29.44	23.23	22.35	21.55
Picnic	18.48	18.62	18.85	14.47	14.16	13.80
Butt	14.30	14.11	13.57	11.20	10.73	9.94
Belly	------	------	------	21.70	23.97	26.80
Total	100.00	100.00	100.00	100.00	100.00	100.00

Source: Original data.

Procedure is thus self-explanatory, being based upon procedures identical to those outlined for Chart E. The four lean cut approach involves the use of the first three columns of Table 19, while the five primal cut approach uses the last three columns of that same table.

The relative accuracy of each of the three approaches for November 15, 1956, is indicated by the summary of per hundredweight wholesale values in Table 20.

The standards of acceptability used in this study may give the erroneous impression that this formula tends to lose its reliability as price increases. While it is true that the error measured in cents per hundredweight increases as price increases, the proportion which the error is of total price does not increase.

TABLE 20.—Summary of per Hundredweight Wholesale Values, November 15, 1956

Total carcass value	Wholesale Value per Hundredweight			Differential	
	Grade 1	Grade 2	Grade 3	1-2	2-3
Five Primal Plus Fat	$18.49	$17.91	$17.44	$0.58	$0.47
Five Primal Cuts	18.19	17.53	17.03	0.66	0.50
Four Lean Cuts	18.33	17.66	17.30	0.67	0.36

Source: Charts E, F and G.

The study involved working with computed constants all the way through the analysis and the constants were independent of the price level. A given percentage error will result in an increase in absolute terms as price increases. The important thing to remember is that if, for example, a 5 percent error is acceptable at the lower end of the range, it also should be acceptable at the upper end of the range.

Thus, the standards for accuracy, when stated in terms of 50¢ and 10¢, are misleading in that they imply a loss of accuracy in the formula at higher price levels. One should recognize that the relative accuracy is the same, but the standards of acceptability become more strict as price increases.

CHART G.—FIVE PRIMAL CUTS: A Suggested Outline by Using this Method for Computing the Intergrade Differential of 195-220 Pound Graded Hogs

Date_____

STEP ONE—Wholesale Weighted Price

Cut and Weight		Grade 1	Grade 2	Grade 3
Ham:	10–12	------	$.0054	$.0646
	12–14	$.0607	.2334	.3355
	14–16	.3019	.1608	.0059
	16–18	.0339	.0015	------
Total		$.3965	$.4011	$.4060
Loin:	Under 12	$.2082	$.3312	$.3400
	12–16	.1347	.0090	------
Total		$.3429	$.3402	$.3400
Picnic:	4– 6	------	$.0260	$.0679
	6– 8	$.1773	.1724	.1368
	8–10	.0233	.0035	------
Total		$.2006	$.2019	$.2047
Butt:	4– 8	$.2775	$.2775	$.2775
Belly:	8–10	$.0621	$.0046	$.0037
	10–12	.1656	.1708	.0905
	12–14	.0137	.0628	.1356
	14–16	.0009	.0007	.0044
Total		$.2423	$.2389	$.2342

STEP TWO—Weighted Wholesale Values—Table 19, Appendix

Cut	Grade 1	Grade 2	Grade 3
Ham	$11.66	$11.55	$11.33
Loin	7.97	7.60	7.33
Picnic	2.90	2.86	2.82
Butt	3.11	2.98	2.76
Belly	5.26	5.73	6.28
Total	$30.90	$30.72	$30.52

STEP THREE—Actual Value

Grade	Step 2 Total	×	Table 15 Constant	=	Value of Stated Weight
1	$30.90	×	49.97	=	$15.44
2	30.72	×	47.74	=	14.67
3	30.52	×	45.82	=	13.98

STEP FOUR—Wholesale Value per Hundredweight Live

Grade	Step 3 Result	÷	Table 16 Constant	=	Wholesale Value per cwt.
1	$15.44	÷	84.9	=	$18.19
2	14.67	÷	83.7	=	17.53
3	13.98	÷	82.1	=	17.03

Source: Original data.

CHART D.—A Suggested Outline for Computing the Intergrade Differential of 195-220 Pound Graded Hogs

Date_____

STEP ONE—Wholesale Weighted Price

Cut and Weight		Grade 1	Grade 2	Grade 3
Ham:	10–12			
	12–14			
	14–16			
	16–18			
	Total			
Loin:	Under 12			
	12–16			
	Total			
Picnic:	4– 6			
	6– 8			
	8–10			
	Total			
Butt:	4– 8			
Belly:	8–10			
	10–12			
	12–14			
	14–16			
	Total			
.80 x PS Lard:				

STEP TWO—Weighted Wholesale Values

Cut	Grade 1	Grade 2	Grade 3
Ham			
Loin			
Picnic			
Butt			
Belly			
Fat			
Total			

STEP THREE—Actual Value

Grade	Step 2 Total	×	Table 15 Constant	=	Value of Stated Weight
1		×	64.27	=	
2		×	64.27	=	
3		×	64.42	=	

STEP FOUR—Wholesale Value per Hundredweight Live

Grade	Step 3 Result	÷	Table 16 Constant	=	Wholesale Value per cwt.
1		÷		=	
2		÷		=	
3		÷		=	

CHART E.—A Suggested Outline for Computing the Intergrade Differential of 195-220 Pound Graded Hogs

Date_____

STEP ONE—Wholesale Weighted Price

Cut and Weight		Grade 1	Grade 2	Grade 3
Ham:	10–12	------	$.0054	$.0646
	12–14	$.0607	.2334	.3355
	14–16	.3019	.1608	.0059
	16–18	.0339	.0015	------
Total		$.3965	$.4011	$.4060
Loin:	Under 12	$.2082	$.3312	$.3400
	12–16	.1347	.0090	------
Total		$.3429	$.3402	$.3400
Picnic:	4– 6	------	$.0260	$.0679
	6– 8	$.1773	.1724	.1368
	8–10	.0233	.0035	------
Total		$.2006	$.2019	$.2047
Butt:	4– 8	$.2775	$.2775	$.2775
Belly:	8–10	$.0621	$.0046	$.0037
	10–12	.1656	.1708	.0905
	12–14	.0137	.0628	.1356
	14–16	.0009	.0007	.0044
Total		$.2423	$.2389	$.2342
.80 x PS Lard:		$.1020	$.1020	$.1020

STEP TWO—Weighted Wholesale Values

Cut	Grade 1	Grade 2	Grade 3
Ham	$ 9.07	$ 8.55	$ 8.03
Loin	6.18	5.65	5.19
Picnic	2.26	2.12	2.00
Butt	2.42	2.21	1.95
Belly	4.09	4.24	4.45
Fat	2.27	2.64	2.97
Total	$26.29	$25.41	$24.59

STEP THREE—Actual Value

Grade	Step 2 Total	×	Table 15 Constant	=	Value of Stated Weight
1	$26.29	×	64.27	=	$16.90
2	25.41	×	64.27	=	16.33
3	24.59	×	64.42	=	15.84

STEP FOUR—Wholesale Value per Hundredweight Live

Grade	Step 3 Result	÷	Table 16 Constant	=	Wholesale Value per cwt.
1	$16.90	÷	91.4	=	$18.49
2	16.33	÷	91.2	=	17.91
3	15.84	÷	90.8	=	17.44

CHART F.—FOUR LEAN CUTS: A Suggested Outline by Using this Method for Computing the Intergrade Differential of 195-220 Pound Graded Hogs

Date_____

STEP ONE—Wholesale Weighted Price

Cut and Weight		Grade 1	Grade 2	Grade 3
Ham:	10–12	------	$.0054	$.0646
	12–14	$.0607	.2334	.3355
	14–16	.3019	.1608	.0059
	16–18	.0339	.0015	------
Total		$.3965	$.4011	$.4060
Loin:	Under 12	$.2082	$.3312	$.3400
	12–16	.1347	.0090	------
Total		$.3429	$.3402	$ 3400
Picnic:	4– 6	------	$.0260	$.0679
	6– 8	$.1773	.1724	.1368
	8–10	.0233	.0035	------
Total		$.2006	$.2019	$.2047
Butt:	4– 8	$.2775	$.2775	$.2775
Belly:	8–10	$.0621	$.0046	$.0037
	10–12	.1656	.1708	.0905
	12–14	.0137	.0628	.1356
	14–16	.0009	.0007	.0044
Total		$.2423	$.2389	$.2342

STEP TWO—Weighted Wholesale Values—Table 19, Appendix

Cut	Grade 1	Grade 2	Grade 3
Ham	$14.89	$15.19	$15.48
Loin	10.17	10.00	10.01
Picnic	3.71	3.76	3.86
Butt	3.97	3.92	3.77
Total	$32.74	$32.87	$33.12

STEP THREE—Actual Value

Grade	Step 2 Total	×	Table 15 Constant	=	Value of Stated Weight
1	$32.74	×	39.12	=	$12.81
2	32.87	×	36.32	=	11.94
3	33.12	×	33.70	=	11.16

STEP FOUR—Wholesale Value per Hundredweight Live

Grade	Step 3 Result	÷	Table 16 Constant	=	Wholesale Value per cwt.
1	$12.81	÷	69.9	=	$18.33
2	11.94	÷	67.6	=	17.66
3	11.16	÷	64.5	=	17.30

Source: Original data.